AMENDMENTS TO THE DRAWINGS

The attached Replacement Sheet(s) for drawings includes changes to **FIG. 8b** and **FIG. 17**. Support for the amendments is provided by the original specification and figures of the application.

Attachment: Replacement sheet

REMARKS

Claims 1- 30 and 32 - 40 are pending in the application. Claim 31 has been canceled and claims 1 and 26 have been amended by way of the present amendment. Reconsideration is respectfully requested.

In the outstanding Office Action, the abstract was objected to because the abstract should provide proper language and format for an abstract of the disclosure; the specification was objected to because of informalities; claim 26 was objected to for minor informalities; the drawings were objected to under 37 CFR 1.83(a); claim 31 was rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement; claims 1, 4, 6, 16, 35 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,246,716 (Schneider) in view of U.S. Patent No. 6,100,716 (Adham et al.) and further in view of U.S. Patent No. 4,755,984 (Ambrosio et al.); claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 6,362,672 (Geist); claim 3 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 6,320,867 (Bellenger); claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 4,977,551 (Minami et al.); claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and Chang et al; claim 8 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., U.S. Patent No. 6,166,573 (Moore et al.), U.S. Patent No. 6,278,785 (Thomasson) and Geist; claims 9, 14, 15 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist and Bellenger; claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and Minami et al.; claim 11 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson and Geist; claim 12 was rejected under 35 U.S.C. § 103(a) as being

unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and U.S. Publication No. 2002/0070783 (Saeki); claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and U.S. Patent No. 5,278,567 (Nourrcier); claim 17 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and Thomasson; claim 18 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist and U.S. Patent No. 6,404,255 (Filliman et al.); claim 19 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Filliman et al. and U.S. Patent No. 5,334,891 (Marbot); claim 21 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and U.S. Patent No. 4,991,166 (Julstrom); claim 22 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., U.S. Patent No. 4,644,178 (Michalik) and U.S. Patent No. 5,742,201 (Eisenberg et al.); claim 23 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and U.S. Patent No. 5,559,841 (Pandula); claims 23 and 40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and Bellenger; claim 24 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and U.S. Patent No. 6,078,356 (Jensen); claims 25 and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger, Jensen and U.S. Patent No. 3,988,686 (Beall); claim 26 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger, Jensen, Beall and U.S. Patent No. 5,742,201 (Eisenberg et al.); claim 27 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,790,335 Sugawara; claim 30 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of

Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,742,201 (Eisenberg et al.); claim 32 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and Minami et al.; claim 33 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,787,114 (Ramamurthy et al.); claim 34 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,726,592 (Schulte et al.); claim 36 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and U.S. Patent No. 6,259,680 (Blackwell); claim 38 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and Chang et al. ; claim 39 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and Minami et al.

Amendments to the Drawings

The drawings were objected to under 37 CFR 1.83(a). The attached Replacement Sheet(s) for the drawings includes changes to **FIG. 8b** and **FIG. 17**. Support for the amendments to the drawing is provided by the original specification and figures of the application. Thus, the amendments to the drawings raise no question of new matter and it is respectfully requested that the outstanding drawing objections be withdrawn.

Amendments to the Specification

The specification was objected to because of informalities. The specification has been amended to remove the informalities, such as typographical errors. Support for the amendments to the specification is provided by the original specification and figures of the application. Thus, the amendments to the specification raise no question of new matter and it is respectfully requested that the outstanding specification objections be withdrawn.

Amendments to the Abstract

The abstract was objected to because the abstract should provide proper language and format for an abstract of the disclosure. In particular, the abstract has been amended to remove the reference to **Fig. 1**. Thus, the amendments to the Abstract raise no question of new matter and it is respectfully requested that the outstanding objection be withdrawn.

Claim Objections

Claim 26 was objected to for minor informalities. Claim 26 has been amended as suggested in the outstanding Office Action. The amendments to claim 26 raise no question of new matter and it is respectfully requested that the outstanding objection be withdrawn.

35 U.S.C. § 112

Claim 31 was rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claim 31 has been canceled by way of the present amendment. Thus, it is respectfully requested that the outstanding rejection be withdrawn.

Amendment of Abstract

The abstract was objected to because the abstract should provide proper language and format for an abstract of the disclosure and various informalities. In response to the objection, the Abstract has been rewritten to provide a more sufficient statement providing proper language and format. Applicants respectfully request withdrawal of the objection.

35 U.S.C. § 103 Claim Rejections

Claims 1, 4, 6, 16, 35 and 37 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,246,716 (Schneider) in view of U.S. Patent No. 6,100,716 (Adham et al.) and further in view of U.S. Patent No. 4,755,984 (Ambrosio et al.).

Claim 1 has been amended to clarify the invention. In particular, claim 1 has been amended to recite:

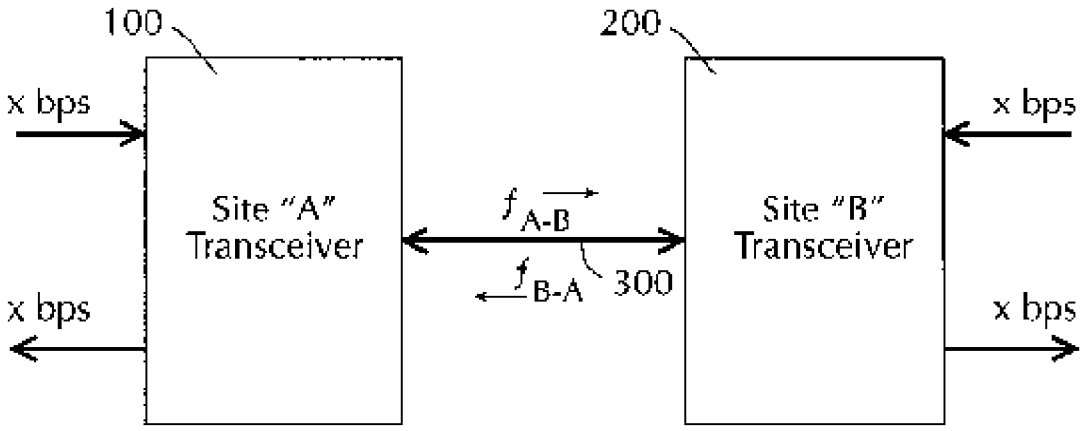
> a transmitter for transmitting a first signal to another integrated circuit,~~;~~ wherein the transmitter having a ~~an output~~ transmitter buffer;
>
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
>
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,~~;~~
>
> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same integrated circuit,~~; and~~
>
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
>
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Schneider discloses the present invention is a communication system for communicating information over greater distances than otherwise possible on bidirectional media subject to interference, by reducing the interference while assuring spectral compatibility with other communication services.[1] In particular, as shown in **FIG. 1** below, Schneider discloses the signal, i.e., the intelligence, message, or effect, to be conveyed over a communication system, is coupled to a bidirectional medium by a directional coupler, i.e., a device at a transceiver used to separate energy to be transmitted from energy to be received, e.g., a hybrid circuit, an analog echo-canceler, a digital echo-canceler, a frequency splitter with echo-cancellation, or a 2wire-4wire ("2W-4W") convertor. The bidirectional media can be radio or microwave links through air or outer space, or copper wire twisted pairs. With reference to FIG. 1, below, Schneider discloses an information communication system constructed and arranged in accordance with the present invention comprises a first plurality of transceivers **100** located at site "A" for providing

[1] Schneider at ABSTRACT.

one or more communication services via bidirectional media **300** to a second plurality of transceivers located at one or more sites "B".[2]

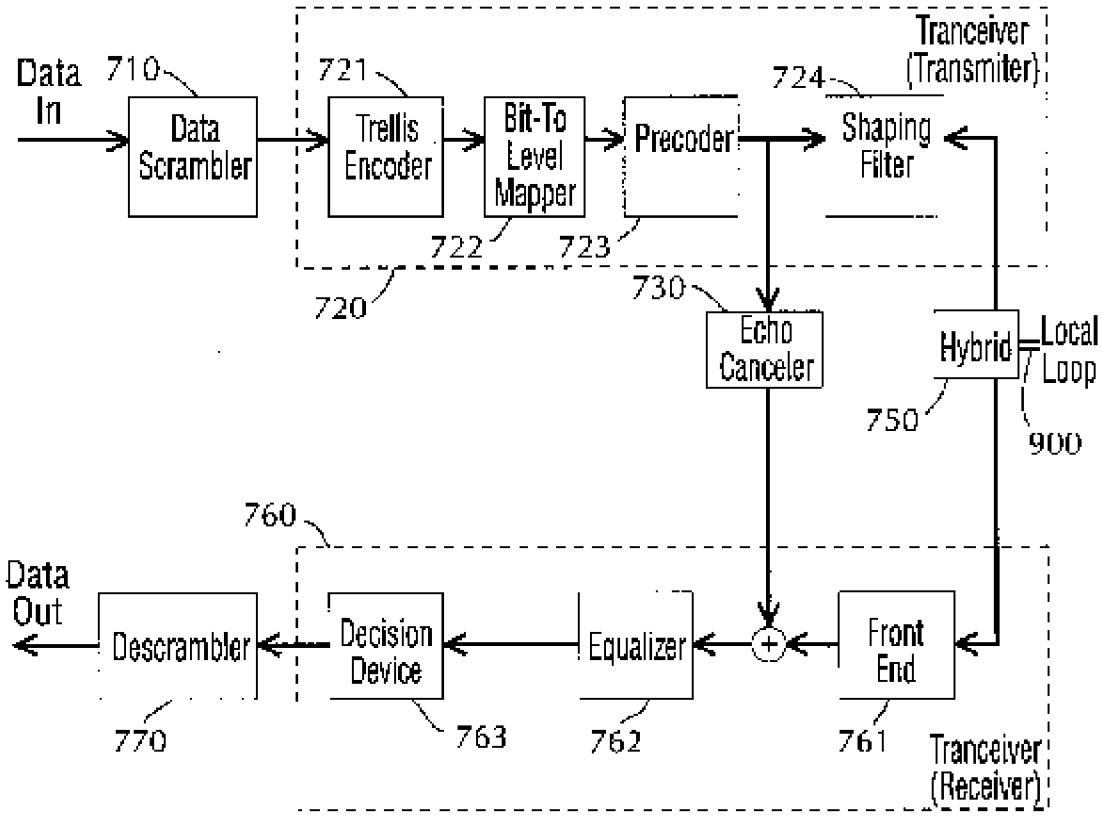
FIG. 1



With reference to **FIG. 1** above, Schneider discloses an information communication system constructed and arranged in accordance with the present invention comprises a first plurality of transceivers **100** located at site "A" for providing one or more communication services via bidirectional media **300** to a second plurality of transceivers located at one or more sites "B".[3] Further, referring to FIG. **4** below, Schneider discloses transceiver **720/760** is of the kind identified in FIG. **3** as transceivers **400**, **500**.[4]

[2] Schneider, Fig. 1; column 1, lines 17-25; column 4, lines 50-58
[3] Schneider, Fig. 1, element 100; Fig. 4, element "Transmitter", column 4, lines 50-58
[4] Schneider, Fig. 1, element 100; Fig. 4, element "Receiver", column 4, lines 50-58; column 7, lines 42-43

FIG. 4



As shown in the figure, Schneider discloses the receiver portion **760** of the transceiver **720/760** comprises a *conventional receiver front end* **761** to which transmissions on the local loop **900** are provided by hybrid **750** (emphasis added). Further as shown in the figure, Schneider discloses the signal output of front end **761** is echo-cancelled by adaptive echo canceler **730** and provided to *conventional decision device* **763**, which can be *a conventional* trellis decoder, via *conventional* adaptive feed forward equalizer **762** (emphasis added).

However, Schneider nowhere discloses as claim 1, recites:

a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;

a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and

a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,

wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,

wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;

wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 has been similarly amended and is the method version of claim 1. That is, based on the outstanding Office Action, it is assumed that transmitter **720** of **FIG. 4** of Schneider is the same as **401** in **FIG. 3** and receiver **760** of FIG. 4 of Schneider s the same as receiver **402** in **Fig. 4** of the application, and that they are co-located on the same circuit. However, if one assumes transmitter **720** is for transmitting a "first signal," as follows from analysis of the circuit in FIG. 4, it shall be admitted that it is *NOT* the same "first signal" that is coupled at the input of the Receiver **760** of FIG. 4 but a signal processed by conventional Hybrid circuit **750** via a local loop **900** from a remote subscriber (i.e., *see* Col. 8, lines 5-7, of Schneider i.e. it is a signal, *significantly distorted and absolutely unsuitable to be used for echo cancelling at the Receiver*).

Further, in view of the above discussion, it should be concluded that Receiver **760** is NOT Receiver **420** of the claimed invention and, consequently, it is NOT co-located on the same circuit, but at the other end of the transmission line (i.e. it is the Receiver **520**). Similarly, a third signal at the input of the transmitter that is coupled to the receiver (signal path via echo canceller) is obviously a simple replica of the first signal, as should be derived from echo canceller being a conventional echo canceller **730** (*see* Col. 7, line 65) and also is distorted.

Further, Schneider discloses the receiver **760** obviously processes the same first signal, and NOT a second signal. This is confirmed by the description of operation of this circuit. In particular, if transmitter **720** were to transmit a first signal out, there should be an OUT signal leaving transmitter **720** apart from a signal passing through local loop **900** (an arrow has a wrong direction); similar, if a receiver portion 760 were to receive a second signal in the meaning of the present patent application, a corresponding signal should be shown in **FIG. 4**.

Furthermore, it shall be appreciated that, as shown in FIG.4 and described at col. 7, lines 60-68, of Schneider, a first signal is shaped by filter **724** and additionally, a precoded signal is provided to a conventional adaptive echo-canceller **730**. Thus, it is a conventional echo cancellation scheme that is employed in FIG.4 of Schneider, where a signal replica is transmitted via echo canceller **730**.

Based on the above considerations, the technique taught by Schneider fails to disclose the features of claims 1 and 35 according to the present invention, and in particular, does not disclose, as amended claims 1 and 35, recite: "wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer *co-located on the same circuit.*"

Further, though Schneider teaches in Col.7, lines 38-60, a PAM (pulse amplitude modulation), Schneider nowhere discloses as independent claims 1 and 35 recite: "the third signal is modulated in phase and amplitude to cancel the first signal at the output of the receiver buffer." More specifically, based on the description in Schneider at col. 7, lines 38-60 and further, it shall be understood that PAM technique is applied to the received signal in path 762 - 770, and NOT to the signal passed through echo canceller **730**.

Further, in Schneider, in order to achieve cancellation of the unwanted transmitted signal in a receiver, a conventional echo canceller passes a replica of the transmitted signal to the receiver where it is subtracted from the bidirectional signal. That is, the mechanism of generating a replica of the transmitted signal and subtracting said signal from the received signal is a well known technique and it seems the Examiner incorrectly believes it is exactly the echo replica that is used in the present invention. However, when applied to high-speed

communications channels or, to long communications channels where the signal is attenuated due to losses in the channel, the use of a replica buffer of similar topology to the transmit buffer is insufficient and exhibit significant drawbacks.

In order to achieve a low bit error rate it is imperative that the unwanted signal be cancelled in the receiver to a high degree. Incomplete cancellation can occur as a result of amplitude or phase mismatch between the transmitted signal and the replica of the transmitted signal. For very high speed communications channels, such as the IEEE XFP standard which has a nominal data rate of 10Gbps, the phase matching required for acceptable cancellation may be as low as a few picoseconds. For long channels where there is substantial attenuation of the transmitted signal amplitude matching has to be significantly better than the attenuation.

Consequently as data rates rise and attenuation levels increase, often as a result of the increased losses due to the higher data rates, there is a need to improve the amount of cancellation beyond that achievable from a simple replica buffer. That is, the present invention uses technique other than the echo replica of the background art. Thus, based on the above discussion, Schneider does not disclose all of the limitations of the claimed invention. The outstanding Office Action acknowledges other deficiencies in Schneider and attempts to overcome those deficiencies by combining Adham et al. and Ambrosio et al. with Schneider. However, Adham et al. and Ambrosio et al. cannot overcome all of the deficiencies of Schneider, as discussed below.

Adham et al. discloses it is common that the presence of a defect causes abnormal gate output voltage excursions in data buffers, AND gates, OR gates and multiplexers in current-mode logic circuits.[5] In particular, **FIG. 1A** of Adham et al. discloses a basic data buffer in CML circuits connected to high and low operating voltage terminals **10**a and **10**b. The signals a and b represent input data and the signals op and opb represent output data in a differential form.[6]Crosstalk is reduced due to paired differential signals, cancelling much of the independent magnetic fields they generate. A second notable advantage of using CML differential signals is

[5] Adam et al. at ABSTRACT.
[6] Adam et al., Fig. 1A, column 5, line 59-column 6, line 25

the high signal to noise ratio while keeping a small output signal swing. Also, small output swings provides a reduction in dynamic power consumption. Furthermore, CML gates always provide a signal and its complement which simplifies circuits and reduces logical depth when inverted signals are needed.[7]

Adham et al. discloses that the test bench used is a chain of buffers where the differential inputs of each gate are taken from the differential outputs of a preceding gate. It is of interest that in such a chain the degraded signals at the outputs of a gate can be restored after few logic stages. As a typical case of that phenomenon, the fault masking problems associated with the collector-emitter (C-E) pipe defect of the current source transistor **19** on a standard CML buffer shown in FIG. **1**A are considered. Further, Adham et al. discloses test circuits, each of them including a chain of 8 buffers. FIG. **1**A of Adham et al. discloses a basic data buffer in CML circuits connected to high and low operating voltage terminals **10**a and **10**b. The buffer includes a differential amplifier of a pair transistors **11** and **13**, the collectors of which are connected to the high operating voltage terminal **10**a via resistors **15** and **17** (e.g., 1 k.OMEGA.), respectively. The coupled emitters of the transistors **11** and **13** are connected to a current source circuit of a transistor **19** and a resistor **21** (e.g., 1.2 k.OMEGA.) which is connected to the low operating voltage terminal **10**b. The transistor **19** supplies stable "sink" current to the transistors **11** and **13**. To stabilize the sink current, an environment independent voltage generator (not shown) feeds the base of transistor **19** with a fixed bias voltage Vb. The power of this design comes from its functional simplicity. The transistors **11** and **13** steer the steady current through one of the two branches by turning on one transistor or the other with gate inputs (signals a and ab). The current in the selected branch will create a voltage drop across its resistor, while in the other branch, where no current flows, the output voltage is kept to the ground level voltage Vgnd. The collectors of the transistors **11** and **13** form a pair used as gate outputs (signals op and opb). In CML, each digital signal is thus represented by the voltage difference between two nodes, which increases the gate's noise margin. This differential signal is large enough to fully steer the current

[7] Adam et al., column 6, lines 39-47

flowing in the gates it drives. The signals a and ab represent input data and the signals op and opb represent output data in a differential form.[8]

In **FIG. 5A**, the test circuit includes a chain of buffers and a device under test (DUT) which contains no defect. In **FIG. 5B**, the test circuit includes a chain of buffers and a DUT which contains the defect.[9]

Crosstalk is reduced due to paired differential signals, cancelling much of the independent magnetic fields they generate. A second notable advantage of using CML differential signals is the high signal to noise ratio while keeping a small output signal swing. Also, small output swings provides a reduction in dynamic power consumption. Furthermore, CML gates always provide a signal and its complement which simplifies circuits and reduces logical depth when inverted signals are needed.[10]

The test bench used is a chain of buffers where the differential inputs of each gate are taken from the differential outputs of a preceding gate. It is of interest that in such a chain the degraded signals at the outputs of a gate can be restored after few logic stages. As a typical case of that phenomenon, the fault masking problems associated with the collector-emitter (C-E) pipe defect of the current source transistor **19** on a standard CML buffer shown in FIG. **1**A are considered. FIGS. **5**A and **5**B show test circuits, each of them including a chain of 8 buffers. In FIG. **5**A, the test circuit includes a chain of buffers **23**.sub.1 -**23**.sub.7 and a device under test (DUT) 25 which

[8] Adam et al, column 5, line 59-67; column 6, lines 6-25
[9] Adam et al., Fig. 5A; column 9, lines 7-21
[10] Adam et al., column 6, lines 39-47

contains no defect. In FIG. **5**B, the test circuit includes a chain of buffers **27**.sub.1 -**27**.sub.7 and a DUT **29** which contains the defect.[11]

Ambrosio et al. discloses the echo canceller for bidirectional digital transmission systems cancels the echo queues of a desired number N of digital symbols, transmitted on the line in the last N signalling periods.[12] Further, Ambrosio et al. discloses the simplicity of the technique facilitates circuit implementation as an integrated circuit.[13]

However, Adham et al. nowhere discloses as claim 1 recites: However, Schneider nowhere discloses as claim 1, recites:

> a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;
>
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
>
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,
>
> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,
>
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
>
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 is the method version of claim 1 and recites similar limitations. That is, based on the above discussion, background art echo cancellers in these and other systems operate by subtracting a replica of the echo of the original signal from the received signal. Examples of such apparatus, wherein the computational overhead associated with echo cancellation in a data

[11] Adam et al., Fig. 5A; column 9, lines 7-21
[12] Ambrosio et al. at ABSTRACT.
[13] Ambrosio et al., column 2, lines 15-16

communications system is reduced by utilizing symmetrical information rates at asymmetrical signal rates. Thus, Adham et al. and Ambrosio et al. cannot overcome all of the deficiencies of Schneider.

Therefore, it is respectfully submitted that none of Adham et al. and Ambrosio et al. or Schneider disclose, suggest or make obvious the claimed invention and that claims 1 and 35, and claims dependent thereon patentably distinguish thereover.

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of U.S. Patent No. 4,755,984 (Ambrosio et al.) and U.S. Patent No. 6,362,672 (Geist).

Claim 2 is ultimately dependent on claim 1. As discussed above, none of the references disclose all of the limitations of claim 1. Thus, at least for the same reason, none of the above-discussed references disclose the limitations of claim 2. In addition, the outstanding Office Action acknowledges deficiencies in the above references and attempts to overcome those defeciencies by combining the above references with Geist. However, Geist cannot overcome all of the defeciencies of the above-references, as discussed below.

Geist discloses a method and apparatus for matching rise time and fall time in two differential signals. The apparatus includes a system that includes an scaled summer, a reference voltage generator, a comparator, and a storage device.[14] However, Geist. nowhere discloses as claim 1 recites:

> a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,

[14] Geist at ABSTRACT.

> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,
>
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
>
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 is the method version of claim 1 and recites similar limitations. That is, based on the above discussion, background art echo cancellers or like circuits disclose the claimed invention. Therefore, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that claim 2 patentably distinguishes thereover.

Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 6,320,867 (Bellenger).

Claim 3 is ultimately dependent on claim 1. As discussed above, none of the references disclose all of the limitations of claim 1. Thus, at least for the same reason, none of the above-discussed references disclose the limitations of claim 3. In addition, the outstanding Office Action acknowledges deficiencies in the above references and attempts to overcome those defeciencies by combining the above references with Bellenger. However, Bellenger cannot overcome all of the defeciencies of the above-references, as discussed below.

Bellenger discloses the current invention provides apparatus for relieving congestion associated with interfacing voice-band data, and broad-band data, with a network such as the public switched telephone network (PSTN).[15]

[15] Bellenger at ABSTRACT.

However, Bellenger. nowhere discloses as claim 1 recites:

> a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;
>
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
>
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,
>
> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,
>
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
>
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 is the method version of claim 1 and recites similar limitations. That is, based on the above discussion, background art echo cancellers or like circuits disclose the claimed invention. Therefore, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that claim 3 patentably distinguishes thereover.

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 4,977,551 (Minami et al.).

Claim 5 is ultimately dependent on claim 1. As discussed above, none of the references disclose all of the limitations of claim 1. Thus, at least for the same reason, none of the above-discussed references disclose the limitations of claim 8. In addition, the outstanding Office

Action acknowledges deficiencies in the above references and attempts to overcome those deficiencies by combining the above references with Minami et al.. However, Minami et al. cannot overcome all of the deficiencies of the above-references, as discussed below.

Minami et al. discloses a tracking servo control system of an optical disk system produces a tracking control output signal for control of a tracking actuator which is adjusted to enable accurate positioning of a focused light beam spot of the optical disk system at the center of a selected groove of a disk, for a variety of optical disks having various groove shapes.[16]

However, Minami et al. nowhere discloses as claim 1 recites:

> a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,
> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 is the method version of claim 1 and recites similar limitations. That is, based on the above discussion, background art echo cancellers or like circuits disclose the claimed invention. Therefore, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that claim 5 patentably distinguishes thereover.

[16] Minami et al. at ABSTRACT.

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., (Bellenger) and Chang et al. (A CMOS Differential Buffer Amplifier with Accurate Gain and Clipping Control; July 1995, IEEE Journal of Solid State Circuits; pages 731-735).

Claim 7 is ultimately dependent on claim 1. As discussed above, none of the references disclose all of the limitations of claim 1. Thus, at least for the same reason, none of the above-discussed references disclose the limitations of claim 7. In addition, the outstanding Office Action acknowledges deficiencies in the above references and attempts to overcome those deficiencies by combining the above references with Chang et al. However, Chang et al. cannot overcome all of the deficiencies of the above-references. That is, Chang et al. nowhere discloses as claim 1 recites:

> a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;
>
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
>
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,
>
> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,
>
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
>
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 is the method version of claim 1 and recites similar limitations. That is, based on the above discussion, background art echo cancellers or like circuits disclose the claimed invention. Therefore, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that claim 7 patentably distinguishes thereover.

Claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., U.S. Patent No. 6,166,573 (Moore et al.), U.S. Patent No. 6,278,785 (Thomasson) and Geist.

Claim 8 is ultimately dependent on claim 1. As discussed above, none of the references disclose all of the limitations of claim 1. Thus, at least for the same reason, none of the above-discussed references disclose the limitations of claim 8. In addition, the outstanding Office Action acknowledges deficiencies in the above references and attempts to overcome those deficiencies by combining the above references with Moore et al., Thomasson and Geist. However, none of Moore et al., Thomasson or Geist can overcome all of the deficiencies of the above-references, as discussed below.

Moore et al. discloses a high resolution delay line includes a coarse delay having a minimum period of delay and a fine delay having a total delay, wherein the total delay is equal to or greater than half the minimum period.[17]

Thomasson discloses an echo is cancelled from a composite signal by providing a coarse phase adjustment, a fine phase adjustment, an amplitude correction, and then subtracting the phase shifted signal from the composite signal.[18]

However, neither Moore et al. or Thomasson. disclose as claim 1 recites:

[17] Moore et al. at ABSTRACT.
[18] Thomasson at ABSTRACT.

> a transmitter for transmitting a first signal to another integrated circuit, wherein the transmitter having a transmitter buffer;
>
> a receiver for receiving a second signal from the other integrated circuit, wherein the receiver having a receiver buffer and co-located on the same integrated circuit; and
>
> a differential buffer coupled between the input of the transmitter buffer and the output of the receiver buffer,
>
> wherein the first signal at the output of the transmitter buffer is coupled into the input of the receiver buffer co-located on the same circuit,
>
> wherein a third signal at the input of the transmitter buffer is passed through the differential buffer and coupled onto the output of the receiver buffer;
>
> wherein the differential buffer adjusts the third signal in phase and amplitude to cancel the first signal at the output of the receiver buffer, whereby the quality of receiving the second signal is enhanced by canceling echoing of the first signal.

Claim 35 is the method version of claim 1 and recites similar limitations. Geist was further discussed above. That is, based on the above discussion, background art echo cancellers or like circuits disclose the claimed invention. Therefore, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that claim 8 patentably distinguishes thereover.

Claims 9, 14, 15 and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist and Bellenger. For the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 10 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and Minami et al. For the reasons as discussed above, it is respectfully submitted that

the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 11 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson and Geist. For the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and U.S. Publication No. 2002/0070783 (Saeki).

Saeki discloses a clock control circuit includes a multiphase clock generating circuit receiving an output signal of a input buffer for generating multiphase clocks; a selector circuit receiving multiphase clocks output from the multiphase clock generating circuit for selecting one of the multiphase clocks; a first variable delay circuit for delaying the output of the selector circuit; a clock buffer dummy receiving the output signal of the variable delay circuit ; a phase comparator circuit for detecting a phase difference between an output from the multiphase clock generating circuit and an output of the clock buffer dummy; and a filter for smoothing the output of the phase comparator circuit.[19] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and U.S. Patent No. 5,278,567 (Nourrcier).

Nourrcier discloses a received expanded radar pulses pass through a surface acoustic wave (SAW) weighted filter (64) for sidelobe suppression, and then into a SAW tapped delay

[19] Saeki at ABSTRACT.

line (66). The pulses appear at the taps (66a,66b,66c) of the delay line (66) coarsely aligned in time, pass through individual SAW matched filters (68,84,86,88) for compression and envelope detectors (70,90,92,94) for demodulation, and then into a summer (74) for post detection integration.[20] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 17 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and Thomasson. However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist and U.S. Patent No. 6,404,255 (Filliman et al.).

Filliman et al. discloses a source (20) provides an input signal (S1) to be phase shifted and a combining circuit (24) concurrently combines first (A), second (B) and third (C) intermediate signals derived from the input signal (S1), and having differing phase shifts (0, -45, +135 deg), to form a phase shifted output signal (S2). A first amplitude controller (34, 38, 30, 32), responsive to a phase control signal (S3) supplied thereto, varies the amplitudes of the second (B) and third (C) intermediate signals in opposite directions (38) for controlling the phase of the phase shifted output signal.[21] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

[20] Nourrcier at ABSTRACT.
[21] Filliman et al. at ABSTRACT.

Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Filliman et al. and U.S. Patent No. 5,334,891 (Marbot).

Marbot discloses a variable delay device 10 includes an ECL gate 11 associated with an adjusting circuit 23 acting on the resistance of resistive load elements 14, 15 of transistors 12, 13 and the resistive load element 18 of the current source 16 at the gate 11 to cause the current produced by the source 16 to vary linearly while keeping the voltage at the collectors of the transistors 12, 13 constant.[22] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 21 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Moore et al., Thomasson, Geist, Bellenger and U.S. Patent No. 4,991,166 (Julstrom).

Julstrom discloses an echo reduction circuit that may be used to reduce the returned echo in communication links with signficant delay. By making effective use of the echo-masking effect of near-simultaneous desired speech energy and the redundancy present in normal speech, the circuit makes possible wide bandwidth, non-choppy, perceived distortion-free, and perceived echo-free teleconferencing.[23] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

[22] Marbot at ABSTRACT.
[23] Julstrom at ABSTRACT.

Claim 22 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., U.S. Patent No. 4,644,178 (Michalik) and U.S. Patent No. 5,742,201 (Eisenberg et al.).

Michalik discloses a circuit and method for converting signals from a photoelectric image sensor into digital signals containing information as to a characteristic of the sensor signals. The photoelectric image sensor provides output pulses having characteristic determined by the manner in which light is incident thereon and this, in turn, is determined by a light influencing medium in an optical path between a light source and the image sensor.[24]

Eisenberg et al. discloses linearity of an RF/microwave power amplifier is enhanced by an amplitude and phase distortion correction mechanism based upon signal envelope feedback, that operates directly on the RF signal passing through the power amplifier.[25] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 23 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and U.S. Patent No. 5,559,841 (Pandula).

Pandula discloses an improved digital phase detector is used in a digital phase lock loop having a digitally controlled oscillator which includes a state controller and a counter. One embodiment of the phase detector includes a digital integrator; a first register and a first absolute value function; a second register and a second absolute value function; and a subtractor.[26] However, for the reasons as discussed above, it is respectfully submitted that the above

[24] Michalik at ABSTRACT.
[25] Eisenberg et al. at ABSTRACT.
[26] Pandula at ABSTRACT.

combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claims 23 and 40 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and Bellenger . However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 24 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and U.S. Patent No. 6,078,356 (Jensen).

Jensen discloses a two-dimensional imaging system employs a multiplicity of radiation sensors disposed in an array of rows and columns. In order to couple signals from each of the sensors from an inaccessible location to an accessible location for processing of the sensor signals to produce an image of a subject viewed by the sensors, a fiber optic link employing both frequency multiplexing and frequency modulation of sensor data connects the sensor array with the signal processing equipment.[27] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claims 25 and 29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger, Jensen and U.S. Patent No. 3,988,686 (Beall).

Beall discloses the present invention relates to a digitally controlled phase shift network for an analog flux-sensing ferrite phase shifter driver, as would be applied in controlling the

[27] Jensen at ABSTRACT.

phase of individual antenna elements in phased array radar systems.[28] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 26 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger, Jensen, Beall and Eisenberg et al. However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 27 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,790,335 Sugawara.

Sugawara discloses an asymmetrical signal detector for detecting an asymmetrical quantity of an asymmetrical signal and a signal regenerating apparatus using this detector.[29] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 30 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and Eisenberg et al. However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

[28] Beall at ABSTRACT.
[29] Sugawara at ABSTRACT.

Claim 32 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and Minami et al. However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 33 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,787,114 (Ramamurthy et al.).

Ramamurthy et al. discloses a loop back test system and method for providing local fault detection within the core or macrocell of an integrated I/O interface device on an integrated circuit is disclosed. The system and method of this invention is suitable for use in any I/O interface having both a transmitter and a receiver section.[30] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 34 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al. and U.S. Patent No. 5,726,592 (Schulte et al.).

Schulte et al. discloses a low voltage differential signal detector capable of detecting low-voltage differential signals over a large common-mode voltage range. The signal detector uses two differential pairs of opposite conductivity type, coupled to each other in a self-biasing manner to detect low voltage swings in a signal over a large common-mode voltage range.[31] However, for the reasons as discussed above, it is respectfully submitted that the above

[30] Ramamurthy et al. at ABSTRACT.
[31] Schulte et al. at ABSTRACT.

combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 36 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and U.S. Patent No. 6,259,680 (Blackwell et al.).

Blackwell et al. discloses the present invention relates to an improved method and apparatus for echo cancellation in a communication system utilizing a bidirectional transmission medium. The invention significantly reduces computational overhead associated with echo cancellation by using sub-Nyquist sampling in the echo path.[32] However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 38 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., and Chang et al. However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

Claim 39 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of Adham et al. and further in view of Ambrosio et al., Bellenger and Minami et al. Reconsideration is respectfully requested. However, for the reasons as discussed above, it is respectfully submitted that the above combination of references does not disclose, suggest or make obvious, the claimed invention and that the above-referenced claims patentably distinguishes thereover.

[32] Blackwell et al. at ABSTRACT.

Conclusion

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 22-0185, under Order No. 22215-00001-US from which the undersigned is authorized to draw.

Dated: September 24, 2007

Respectfully submitted,

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Attachments

REPLACEMENT SHEET

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